A Dissertation on

COMPREHENSIVE STUDY OF ENDONASAL ENDOSCOPIC DACRYOCYSTORHINOSTOMY

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CERTIFICATE

This is to certify that this dissertation in **"COMPREHENSIVE STUDY OF ENDONASAL ENDOSCOPIC DACRYOCYSTORHINOSTOMY"** is a work done by **Dr.B.KARTHIKEYAN** under my guidance during the period 2004 - 2007. This has been submitted in partial fulfillment of the award of M.S. Degree Examination (Branch - IV, Otorhinolaryngology) by the Tamil Nadu Dr.M.G.R. Medical University, Chennai - 600 032.

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CONTENTS

INTRODUCTION

Increased lacrimation (epiphora) is a troublesome symptom for both patients and doctors; Even though various causes produce epiphora dacryocystitis is the commenest pathalogical cause for epiphora. Chronic dacryocystitis is treated with dacryocysto rhinostomy.

The surgical procedure of diversion of lacrimal flow within nasal cavity through an artificial fistula made at the level of lacrimal sac is called dacryocystorhinostomy. The surgery has been performed for the post 100 years.

Initially external DCR gained popularity largely due to simplicity of technique and complexity of endonanal approaches and became the treatment of choice. Recently after the advent of endoscopes, endoscopic endonasal DCR regained popularity. This is largely due to well illuminated panoramic view of endoscopes, high digital quality imaging and technical advances in the rhinological instrumentations.

In the study we comprehensively analize in detail about the dacryocystitis disease pattern and its endonasal endoscopic surgical management with its 6 months follow up.

AIMS OF THE STUDY

The aim of the study is comprehensive analysis of dacryocystits and its endonasal endoscopic management.

The aims of the study are

1. Age distribution
2. Sex distribution
3. Analyse symptomatology
4. To analyse various investigations to select ideal patient for surgery.
5. Analyse result of technique
6. To study the surgical complications and its management.
7. To analyse the results with six month follow up.

REVIEW OF LITERATURE

History of the endonasal dacryocystorhinostomy

Evolution of endonasal surgery dates back to 1893.

1893 – Caldwell did trephining of the nasolacrimal duct

1910–West did endonasal approach by making sac opening above the nasolacrimal duct.

1921 – Mosher - later discontinued the approach

1925 – Kofler via trans septal route

1962 - Jones introduced silastic tube intubation

1988 – Rice - endoscopic dacryocystorhinostomy

1990 – Massaro – laser endonasal dacryocystorhinostomy

1991 - Gonnering used endoscope and laser

EMBRYOLOGY OF LACRIMAL SYSTEM

Larimal gland – derived from number of buds that arise from upper angle of conjunctival sac which is of ectodermal in origin.

LACRIMAL SAC AND NASOLACRIMAL DUCT – are derived from the ectoderm of naso optic furrow which lies along the line of junction of the maxillary process and the lateral nasal process and extends

from the medial angle of the eye to the region of the developing mouth.The ectoderm of the furrow become buried to form solid cord that subsequently canalized to form lacrimal sac in the upper part and nasolacrimal duct in the lower part.

LACRIMAL CANALICULI – formed by the canalization of ectodermal buds that arise from the margins of each eyelid near its medial end and grow towards lacrimal sac.

ANATOMY OF LACRIMAL APPARATUS

LACRIMAL GLAND

Situated in the lacrimal fossa at the outer part of orbital plate of frontal bone. It is a serous acinar gland, which has a orbital part and a palpaberal part. It secretes tear into the superior fornix through 10- 12 numbers of lacrimal ducts.

Accessary lacrimal glands are called *Krause glands,* which are located below the conjunctiva between the fornix and tarsus. Upto 42 acini open into the upper fornix and 6-8 acini open into the lower fornix.

Blood supply

The arterial supply of the lacrimal gland is through,

- Lacrimal artery.
- Superior and inferior branch of ophthalmic artery.

- Angular artery.
- Inferior orbital artery and
- Branches of sphenopalatine artery

The venous drainage is through the

- Angular veins
- Infraorbital veins.

Nerve supply

The afferent reflex is through the *Trigeminal nerve.*

The efferent pathway is through the

Lacrimal nucleus (*near SSN)*

↓

Nervus intermedius

↓

GSPN (Greater Superficial Petrosal nerve)

↓

Nerve of Pterygoid canal

↓

Pterygopalatine ganglion

↓

Lacrimal nerve

↓

Lacrimal gland

LACRIMAL PATHWAY

PUNCTUM : Present at the medial end of the superior and inferior lid located on a slightly raised area known as *lacrimal papilla,* 0.1 to 4 mm in diameter. They are directed posteriorly against eyeball. The inferior punctum lies 0.5 mm lateral to superior punctum.

CANALICULI : It has vertical and horizontal part. Both joins at a part called *ampulla.* The vertical part 2 – 2.5 mm long and horizontal part 7 – 10 mm long. Both joins to form common canaliculi which joins the sac through *valve of Rosenmuller.*

LACRIMAL SAC : Lacrimal sac lies in the lacrimal fossa which is bounded anteriorly by anterior lacrimal crest and posteriorly by the posterior lacrimal crest. Anterior lacrimal crest is formed by the frontal process of maxilla. Posterior lacrimal crest is formed by the lacrimal bone. Fossa can be formed predominantly by either frontal process of maxilla or lacrimal bone. Lacrimal sac is covered by fascia, which is attached to anterior and posterior lacrimal crests. The fascia covers the orbicularis occuli muscle. Medial palpebral ligament and the angular vein lie anteriorly and the medial palpebral ligament does not extend inferiorly and covers the sac only superiorly. Orbicularis oculi and the fascia cover the lower part of the sac on the lateral side.

Blood supply

The arterial supply of the lacrimal sac are from

- Branches of ophthalmic artery
- Angular artery
- Inferior orbital artery.

The venous drainage is by the angular and infraorbital vessels.

The lymphatic drainage is to the submandibular and deep cervical nodes.

NASOLACRIMAL DUCT

Nasolacrimal duct has bony and soft part. Bony part is approximately 10 mm surrounded by maxilla, lacrimal and inferior turbinate bones and the soft part around 5 mm. It is directed downwards, backwards and inwards. Opens into inferior meatus at the junction of anterior one third and posterior two third and bounded by Hasner's valve. The upper part of the nasolacrimal duct is the narrowest part and common site of obstruction. The mucosa of the nasolacrimal duct is columnar epihelium, ciliated in some places. The nasolacrimal duct had rich plexus of vessels around it forming an erectile tissue resembling that of inferior concha. Engorgment of this vessel itself sufficient to obstruct the duct.

VALVES OF LACRIMAL SYSTEM:

Number of valves are present in the lacrimal drainage system. All these are mucosal folds without valvular function as the fluid can regurgitate at the lower puncta.

Valve of Bochdale : It is the first valve seen at the lacrimal punctum.

Valve of Foltz : It lies after the puncta where the vertical canaliculi start.

Valve of Rosenmuller: It is present at the entry of common canaliculus into the lacrimal sac. It prevents reflux of tears into the common canaliculus.

Valve of Huscke: Present in the common cannaliculus before it joins the lacrimal sac.

Valve of Taillefer: It lies within the nasolacrimal duct.

Valve of Krause or Bernaud: It lies near the lower end of the sac.

ENDOSCOPIC ANATOMY OF LATERAL WALL OF NOSE

The lateral wall of the nose contains numerous bones. They have three scroll like projections called superior, middle and inferior turbinates and between them superior, middle and inferior meati.

Anteriorly the wall is formed by the inner aspect of the nasal bone, the frontal process of the maxilla, lacrimal bone and the inferior turbinate anterior end.

UNCINATE BONE – It is a thin almost sagittally oriented bony leaflet in a shape of a boomerang that runs from anterosuperior position posterinferiorly.

Inferiorly bony spicules at the posterior end of the uncinate process attaches to the lamina perpendicularis of the palatine bone and inferiorly to the corresponding ethmoidal process of the inferior turbinate.

Ascending anterior convex margin of the uncinate process is in the contact with the bony lateral wall and extend as far as lacrimal bone.

Postero superior margin of the uncinate is sharp, concave and lies largely parallel to the anterior surface of the bulla ethmoidalis.

Superiorly it may insert into the lamina papyracea to form recessus terminalis or medially into the middle turbinate or skull base.

MIDDLE TURBINATE – It is a part of ethmoid labyrinth. The most anterosuperior insertion of the middle turbinate is adjacent to crista ethmoidalis of the maxilla which produces an anterior buldge known as agger nasi. The posterior end of the middle turbinate is attached to crista ethmoidalis of perpendicular plate of the palatine bone.

The intervening area of the insertion of the middle turbinate can be divided into three parts.

The anterior third of the middle turbinate inserts vertically in a purely sagittal direction onto the lateral end of the lamina cribrosa directly across the lamina lateralis.

The middle third , the middle turbinate fixed to the lamina papyracea by the ground lamella which here runs in an almost frontal plane.

The posterior third now almost horizontal ground lamella form the roof of the posterior section of the middle meatus and is fixed to the lamina papyracea and or medial wall of the maxillary sinus.

AGGER NASI – It is the prominence that is seen at the anterior attachment of the middle turbinate. When the agger nasi is pneumatized by anterior ethmidal cell it forms the agger nasi cell. It is bounded anteriorly by the frontal process of the maxilla, antero laterally by nasal bone, superiorly by the frontal recess, inferomedially by the uncinate process and inferolaterally by the lacrimal bone. They themselves overlie the lacrimal sac and separated from the sac by thin layer of the bone.

INFERIOR TURBINATE – Is a separate bone. It has irregular surface, perforated and grooved by the vascular channels to which mucoperiosteum is firmly attached. It has maxillary process which

articulates with the maxillary hiatus, articulates with palatine, ethmoidal and lacrimal bones thus completing the medial wall of the nasolacrimal duct.

INFERIOR MEATUS – lies lateral to the inferior turbinate. It is the largest meati extending over the entire floor and the highest point in the inferior meatus is at the junction of anterior1/3rd and posterior 2/3^{rd,} front of which opens the nasolacrimal duct.

LACRIMAL BONE

It has two surfaces and four borders.

Lateral or orbital surface – divided by vertical ridge called Posterior lacrimal crest. In front of this ridge there is a groove, the anterior border of which articulates with the posterior border of the frontal process of the maxilla, forming the lacrimal fossa. The medial wall of the groove is prolonged downwards as descending process to assist in the formation of the canal for nasolacrimal duct by articulating with the nasolacrimal groove of the maxilla and the lacrimal process of the inferior concha. The crest end below in a small hook called lacrimal hamulus which articulates with the maxilla and forms the upper surface of the nasolacrimal canal.

MEDIAL OR NASAL SURFACE – divided into lower anterior and upper posterior parts. Lower anterior part forms part of middle meatus and upper posterior part articulates with the ethmoids.

- Anterior border –articulates with the frontal process of maxilla
- Posterior border-articulates with lamina papyracea
- Superior border- articulates with the frontal bone.
- Inferior border- articulates with the orbital surface of the maxilla .

Ossification: It is ossified from one center which appears about the twelfth week of intrauterine life in the membrane covering the cartilaginous nasal capsule.

FRONTAL PROCESS OF MAXILLA

It projects upwards and backwards between the lacrimal and nasal bones.The anterior border articulating with the nasal bone and posterior border with lacrimal bone.

The lateral surface have a ridge called anterior lacrimal crest and the part posterior to it forms a part of the lacrimal fossa. There is a groove behind it, which articulates with lacrimal bone.

The medial surface of frontal process of maxilla forms a part of lateral wall of the nose. The upper rough part articulates with the ethmoid labyrinth closing the ethmoidal air cells. The lower smooth part is called ethmoidal crest, the posterior part of which articulates with the middle nasal concha and the anterior part underlies the aggernasi on the lateral wall of the nose. The ethmoidal crest forms the upper limit of the atrium of the nose.

PHYSIOLOGY OF LACRIMATION

Tears are formed in the form of preocular film in the conjuctival fornices and along marginal tear strips. The marginal strips are the wedge shaped tear menisci that run along the posterior border of the upper and lower lid at a point where they are closely opposed to the eyeball. These strips become continiuous at the lateral canthus and the medial canthus. Anterior limit of the marginal strip lies at the mucocutaneous junction of the lid margin. This layer which posterior to the tarsal gland, has a lipid layer and provides non wetable hydrophobic surface which repulses the tear and brimming over.

Preocular film covers the interpalperable portion of the eyeball and the cornea.

The tear layer is made up of

1. **Deep mucin layer:** Attached to the glycocalyx of the surface epithelial cells.

2. **Middle Aqueous layer:** Forms the major component of the tear film, contains dissolved salts, proteins, enzymes, and antimicrobial substances. This aqueous layer is mainly secreted by the accessory lacrimal glands.

3. **Surface Oily layer:** It is 0.1mm thick secreted by the Meibomian oil glands and gland of Zeis. It contains lipid with wax and cholesteral. It also contains phospholipids and hydrocarbons.

The lacrimal flow consists of following steps;

a. Circulation of tears from lacrimal gland to the nose is helped by blinking reflex and permeability of lacrimal canaliculi. Blinking reflex involves opening and closing of lids.

b. On blinking orbicularis occuli helps in creating positive and negative pressure in the lacrimal sac which sneaks tear into it. This is called tear pump. Of these 70% of tear enters the inferior canaliculi and 30% enters the superior canaliculi.

c. Lacrimal secretion after entering conjuctiva spreads evenly over it and enters the canaliculi and pass through the sac, nasolacrimal duct, and into the nose.

PATHOLOGY

EPIPHORA: Excessive watering of eyes is known as epiphora.

Epiphora can be due to

1. Increased tear secretion

    Irritation of eyes.

    Foreign bodies

    Ingrowing of eyelashes

    Eye infection

    Malignancy

2. Inability of eyelid to blink

    Nerve injury

    Muscle injury

    Defective blink reflex

3. Factors affecting tear flow.

    Misplaced or abnormal puncta

    Blockage of lacrimal apparatus

Inflammation of lacrimal apparatus

Foreign body in lacrimal passage.

Sinus and nasal infection.

Dacryocystitis is inflammation of the lacrimal sac. Most common cause of dacryocystitis is blockage of nasolacrimal duct leading to inflammation of the sac.

The inflammation of the sac can be either

a. Acute

b. Chronic

It can be

- Congenital
- Acquired

Age: common in adults. Next common age to appear is newborn.

Sex: occurence is more common in females 80:20.

Higher incidence is attributed to narrow lumen of the bony canal in females.

ETIOLOGY

Normal functioning of lacrimal passage is resistant to infection and tears also have bacteriostatic action. The conjuctival infection normally does not spread down to the lacrimal sac. Lacrimal sac inflammation is possible only if there is stasis secondary to actual obstruction or due to congested and edematous nasal mucosa. so both stenosis and inflammation of nasolacrimal duct can produce inflammation of lacrimal sac.

Nose contributes to infection of lacrimal sac in the following ways;

1. Structural anatomy

   Closing of lower end by polyps and granulation in inferior meatus.

   Mucosal edema of inferior turbinate.

2. Ascending infection from nose through nasolacrimal duct.

3. Ethmoidal inflammation

4. Allergic rhinitis with hypertrophied inferior turbinate.

5. Deviated nasal septum pushing inferior turbinate laterally.

6. Pneumatisation of nasolacrimal duct and ethmoidal air cells.

7. Atrophic rhinitis due to secondary infection.

BACTERIOLOGY

The common organisms causing infection of the lacrimal sac includes,

Staphylococus epidermidis

Staphylococus aureus

Streptococus sp.

Pneumococus sp.

Peptostreptococus

E.coli

Propinobacterium

SYMPTOMS

The infection and inflammation of the lacrimal sac presents as

I. Redness
II. Watering of eyes
III. Swelling
IV. Odema of eyelids
V. Tenderness
VI. Mass
VII. Fistula.

The chronic cases have the following presentation as

Epiphora

Discharge from eyes (watery, purulent, mucopurulent)

Regurgitation

Mucocele

COMPLICATIONS

The complications of dacryocystitis includes

- Conjunctivitis
- Keratitis
- Periorbital cellulitis
- Orbital cellulitis
- Abcess and fistula formation
- Infection.

INVESTIGATIONS

It includes

1. Pressure over lacrimal sac for regurgitation
2. Probing

3. Syringing
4. Dacryocystography
5. Scintigraphy
6. Lacrimal endoscopy
7. Helical computed tomography dacryocystography with 3D reconstruction.
8. Diagnostic nasal endoscopic examination
9. CT paranasal sinuses

PROBING

Procedure: After instilling 4% Xylocaine into the eye, Punctum is dilated with Nettleship's punctual dilator. The probe is introduced vertically for 1-2 mm with lid stretched and canula is rotated between the index finger and thumb for smooth penetration into the canaliculus. Then the cannula is turned horizontally 90° in a way that it becomes parallel to the canaliculus. Then the Bowman's probe is introduced in the sameway.

Inference

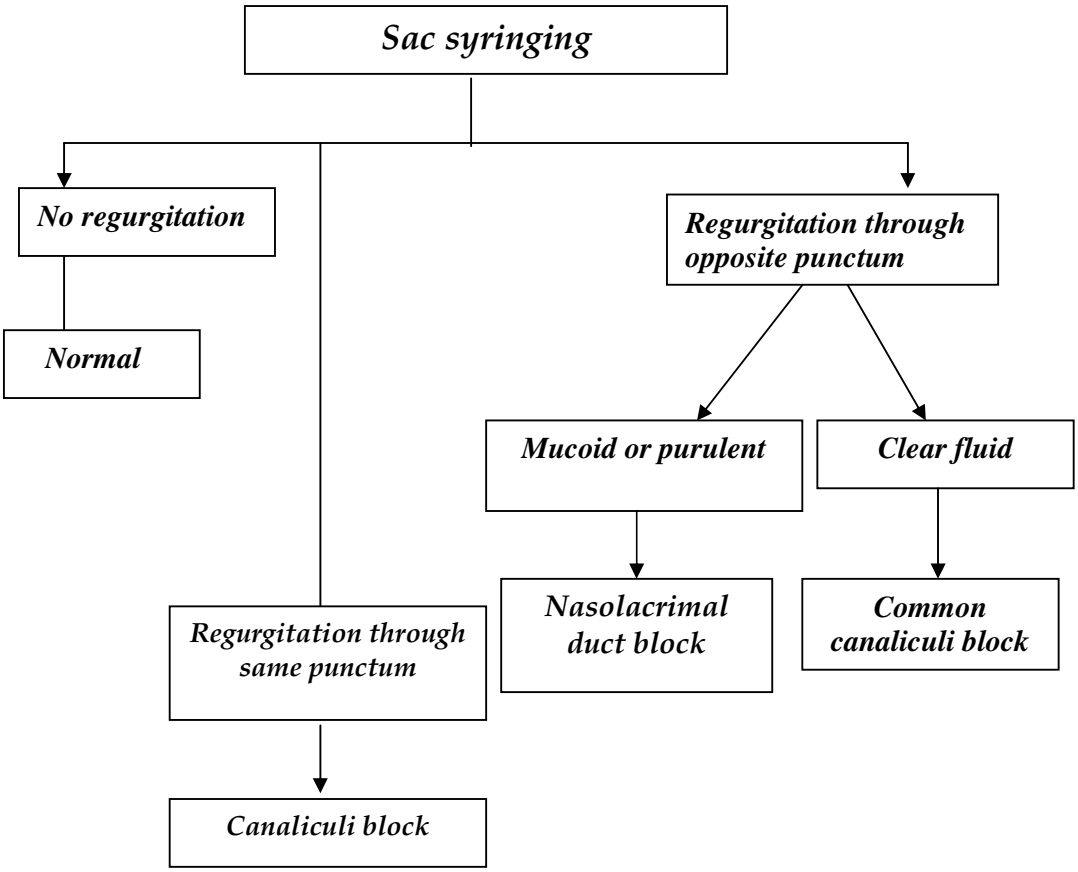
If a soft block is felt then there may be canalicular or common cannalicular block.

If hard stop is felt then it indicates the probe is in the sac and touching the bone suggesting the block is some where below and not in

the canaliculi. Probing is continued to the sac and if the block is felt then the same procedure is repeated in the upper punctum.

SYRINGING

Syringing helps in localizing the site of block in the lacrimal passage.



During syringing if flow occurs with pressure it denotes stenosis.

JONES DYE TEST

Jones dye test is done to assess the patency of the lacrimal passage.

Procedure

1. One drop of flourescein is instilled into the conjuctival sac.
2. A cotton packed with 4% Xylocaine is kept in the inferior meatus.
3. If flourescein is detected after 5 minutes it is called *Positive primary Jones test.*
4. If no flourescein is detected it is inferred as *Negative primary Jones test.*
5. Then excess of flourescein is washed from the conjuctival sac and syringing done. If flourescein is detected then it is called *Positive secondary Jones test.* It shows functional obstruction in nasolacrimal duct.
6. After syringing if no dye is detected then it is inferred as *Negative secondary Jones test.* Inference is no dye in the sac and indicates punctual stenosis or canalicular stenosis.

SCHIRMER'S TEST

This test is done to differentiate the excessive lacrimation from epiphora due to lower down obstruction in the lacrimal passage.

DACRYOCYSTOGRAPHY

Dacryocystography is a method to detect exact site of obstruction in the lacrimal pathway.

In this test a radiographic contrast dye is injected via the punctum into the lacrimal pathway and it is analysed using X-ray or CT scan. CT scan is better than X-rays and CT subtraction can also be done to view the soft tissue details. Both lipid and water based dyes are used. Lipid soluble Lipidal, Ethiodon, Pantopaque and water based dyes as Meglumen, Dilizarate and Iodipamide are used in the procedure.

INTERPRETATION

- Normal dacryocystography
- Blocked lacrimal pathway
- Level of obstruction

  Complete or incomplete
- Dilated sac
- Dacryocystocoele.

MACRODACRYOCYSTOGRAPHY

Macrodacryocystography is particularly useful in revealing details of lacrimal sac anatomy and the site of nasolacrimal duct obstruction.In this the anatomical details are enlarged without distortion.

SCINTIGRAPHY

Lacrimal scintigraphy uses radioisotope dye technetium 99 pertechnate dye. It is a dynamic study with static view taken at 5, 10, 15, and 20 minutes. The resultant scintigram is divided into

- Presac delay - isotope will not enter the sac in five minutes.
- Preductal delay – isotope will be seen in the sac in five minutes but no isotope in duct.
- Intraductal delay – isotope will be seen in the upper part of the nasolacrimal duct with no flow beyond that.

Helical computed tomography dacryocystography with 3D reconstuction

In this technique both plain and contrast enhanced CT are taken and reconstructed to see the virtual image of entire lacrimal passage. In this technique contrast is given into the lacrimal passage through the punctum. In this both soft tissue details and the surrounding bone details can be obtained non invasively.

LACRIMAL ENDOSCOPY

Lacrimal endoscopy is a new non-invasive method used to view directly and localize the obstructions precisely. It allows differentiation

between inflammatory, partial and complete stenosis. Endoscopy enables one to choose the appropriate surgical therapy for patients. Though at present cannot replace the gold standard invasive techniques to find out the site of the obstruction it is extremely useful adjunct in determining proper surgical modality.

Endoscopes used in the lacrimal endoscopy have the following specifications:

- 0.3mm/1800pixels/22 light fibres/70^0 field of vision
- 0.5mm/3000pixels/46 light fibres/70^0 field of vision

Procedure

Under local anaesthesia , after irrigating and cleaning the lower cannaliculus the punctum is dialated and endoscope inserted, with gentle irrigation endoscope is slowly advanced towards the canaliculus, upon reaching the lateral wall of the lacrimal sac the endoscope held upwright and advanced towards nasal meatus and into the nose under inferior turbinate. Continuous irrigation is necessay for good imaging.

Stenosis and scar formation of the lacrimal drainage system, as well as inflammation of the mucous membrane were localized and recorded during the examination.

Normal distention of the lacrimal system is seen as widening of the lumen during irrigation and easy handling of the endoscope.

The stenosis could not be widened during irrigation and the endoscope met with the resistance similar to that encountered with the conventional probing of the lacrimal system[9].

The normal mucosa of the lacrimal system is usually smooth, light pink, and moves during irrigation. Post inflammatory condition shows thickened mucosa of a more reddish grey colour with large papillae.

Advantage of endoscopic examination is direct visualization and précised localization of lacrimal drainage system and its mucous membrane. The decision about the type of surgery can be made with it. It can be performed in the outpatient setting with out side effects.

DIAGNOSTIC NASAL ENDOSCOPY:

Nasal endoscopy is critical in preoperative evaluation for two important reasons

1. To evaluate the relation of septum to lateral nasal wall.

2. Any intranasal pathology like polyps, tumors has to be identified if present and has to be dealt before doing dacryocystorhinostomy.

OPERATIVE TECHNIQUE

At our institution endonasal dacryocystorhinostomy is performed under both local or general anesthesia.

Local anaesthesia

Nasal cavity is shrinked with mixture of 4% Xylocaine 30 ml and 1:1000 adrenaline 0.5 cc.

With premedication of

1 cc fortwin

2 cc Phenergan

1 cc Atropine

Local infiltration of 1% Xylocaine with 1:200000 epinephrine is given over

(a) Lacrimal sac area using 5cc syringe with 26 G needle.

(b) Lower edge of the anterior lacrimal crest just above attachment of inferior turbinate.

(c) Anterior border, superior and inferior attachments of uncinate.

General anaesthesia

Using Thiopentone, iv induction was done followed by succinyl choline. Orotacheal intuabation done with throat pack and anaestheasia maintained with volatile agent halothane or isoflourane.

Nasal packing is done with 4%xylocaine 30ml and 1:1000 adrenaline 0.5cc.

Local infiltration given with 1%xylocaine with 1:200000 epinephrine.

Procedure

Under the above anesthesia with patient in supine position with head end elevated 10°, local infiltration given and nose packed with mixture of 4% xylocaine and adrenaline. 0° and 30° 4mm Hopkins rod endoscopes are used.

Step 1 : Using 15 size blade, a reverse C shaped mucosal incision 10 mm x 10 mm is made at the lateral wall anteriorly and slightly superiorly to the insertion of the middle turbinate and posteriorly based flap elevated from maxillary bone extending upto the uncinate process.

Step 2 : Using Kerrison's punch frontal process of Maxilla is nibbled for the entire length lacrimal sac, lacrimal bone removed and the lacrimal sac exposed from fundus to the orgin of Nasolacrimal duct.

Step 3: Medial wall of lacrimal sac is opened anteriorly with sickle knife. Anterior and posterior flaps are made with scissors.

Step 4: Syringing done through the punctum to see the drainage. After confirming that the nasal flap mucosa trimmed and lacrimal sac mucosa is also trimmed and both were approximated so as to make continious lining.

Step 5 : Nasal packing is done with medicated Vaseline gauze if bleeding present. No packing done if there is no bleeding.

Pack removed on the 1st post operative day and advised nasal saline drops post operatively. Office cleaning done after 1 week, fortnightly for two months and monthly for next 6 months.

COMPLICATIONS OF ENDONASAL DCR

The complications of intranasal DCR are classified as intraoperative and post operative.

INTRA OPERATIVE

1. Bleeding - is more common while elevating the flap over the root of anterior attachment of the middle turbinate, this is due to avulsion of mucosa of the middle turbinate. This can be avoided using true cut forceps or electro cautery. Hypotensive anaaesthesia also minimizes bleeding.

2. Injury to lamina papyracea – if the dissection is extended posteriorly injury to lamina papyracea can occur. It produces prolapse of orbital fat into the nasal cavity. Pressure over the eyeball produces movement of fat(Stankiewicz sign).

3. Severe lid edema – is a less common complication due to repeated probing for sac position especially in cases of common canalicular block.

4. Cerebrospinal leak – is a very rare complication which occurs when we use chisel and hammer to break the bone.

POSTOPERATIVE COMPLICATIONS

Immediate postoperative complications:

1. Pain around the bridge of the nose.
2. Periorbital ecchymosis.
3. Headache.
4. Bleeding.

Late postoperative complications:

1) Adhesion formation leading to the closure of rhinostomy with synaechiae formation.

2) Complications of silicon intubation.

    1. Laceration of canalliculi.

    2. Slitting of puncta.

    3. Granuloma formation at rhinostomy site.

    4. Displacement of tube.

    5. False passage may be created by the tube.

    6. Extrusion of the tube.

    7. Bleeding.

    8. Rarely difficulty in removing the tube.

Difficulties encountered during endoscopic DCR

- Thick and hard bone is difficult to remove sometimes. Powered instruments can be used to overcome this problem.

- Narrow nasal cavity and high septal deviations makes visualization and instrumentation difficult.
- Anatomical variations can lead to identification of sac difficult.
- Generalised hypertrophy of the mucosa bleeds more if preparation is not adequate.
- Narrow or stenosed punctum is at times difficult to locate.
- Small contracted sac due to repeated infection makes opening of medial wall of sac difficult.

Factors affecting the results

- Rhinostomy made at higher level remains patent for long time. This is the area where the fundus of the sac ,the canaliculi and common canaliculi lie in the same axis as of the superior part of the sac.
- Favourable anatomy ie wide nasal cavity, normal size middle turbinate and uncinate process has better results.
- Clean surgery with fewer trauma to the surrounding structures reduces and also improves the result of the surgery.

- Adequate size of bony window with removal of the bony process of the maxilla has good prognosis with better long-term results.

- Cold steel instruments are better then laser in avoiding granulation formation and scarring.

- Stenting in selected cases improves prognosis.

Advantages of Endonasal Endoscopic Dacryocystorhinostomy are

- it avoids facial scar,

- minimal post operative discomfort,

- can be performed on both eyes,

- can be performed as day care procedure

- can be done even during lacrimal abscess presentation

- warfarin and aspirin need not be discontinued during surgery.

- Injury to the angular vein, medial palpabral ligament, orbicularis oculi are avoided.

- Revision surgery easy.

The disadvantage of endonasal DCR are

- Suturing of the mucosal flaps not possible.
- If lacrimal fistula is present then it has to be addressed separately via an external approach.
- If nasal cavity is narrow then opening of big neo ostium is difficult.

OTHER TYPES OF ENDONASAL PROCEDURES

The other endonasal dacryocystorhinostomy are

- Powered DCR.
- Endonasal laser assisted DCR
- Ballon dacryocystoplasty

POWERED DECRYOCYSTORHINOSTOMY – In powered endoscopic dacryocystorhinostomy microdebridor with 2.5mm diamond burr is used to remove the thick frontal process of the maxilla to expose the entire sac. Once the sac exposed punctum were dilated and the lacrimal probe was passed so that it tent the medial wall into nose through the bony ostium created.

With the guidance of the probe vertical incision is made on the medial wall using the Lacrimal spear knife.

Using Lacrimal mini sickle knife releasing incisions were made at the top and bottom of the vertical incision and anterior flap is rotated over the lateral wall mucosa. Using scissors a similar posterior flap is rolled over lateral nasal wall. Mucosa of the agger nasi opened and the edge of the mucosa is approximated to the postero superior lacrimal mucosa. The nasal flap mucosa is trimmed so that this flap mucosa approximates the lacrimal mucosa along the superior, posterior and inferior edges. This approximation reduces the granulation tissue and synechiae formation. Patency of the canaliculus and the neo ostium were maintained by silastic tubing which were subsequently removed.

Endoscopic laser assisted dacryocystorhinostomy

Commonly used lasers in dacryocystorhinostomy are carbondioxide laser, poatassium titanium phosphate laser, argon laser and carbondioxide laser, poatassium titanium phosphate laser, argon laser and yittrium aluminium garnete [YAG] laser. HO:YAG is best among them because of its better bone cutting property.

Routes by which lasers are used in dacryocystrhinostomy are

- Transnasal laser dacryocystorhinostomy
- Translacrimal laser dacryocystorhinostomy.

Transnasal laser assissted dacryocystorhinostomy

Laser is used to cut the mucosa and bone via transnasal route. Though bleeding is less, making wide opening is difficult and postoperative synechiae in neo ostium is more when laser is used to open the lacrimal sac. So long term results are not higher than the non laser assisted endoscopic techniques and external dacryocystorhinostomy.

Transcanalicular laser assisted dacryocystography

With advante of micro flexible endoscopes, translacrimal intervention gained popularity. Christenbury reported a translacrimal laser dacryocystorhinostomy with argon laser[4].

His success rate was 60% and main problem was bone penetration with lasers and osteotomy formation.

Levin and stermogipson reported an anatomical study with a titanium - potassium laser to create a bony opening of 4 x 6mm[12.]

Advantages of the trans canalicular laser assisted DCR are

1. It is a fast technique even faster the conventional endoscopic DCR.
2. If one faces failure revison is so easy thath it does not feel like a revision surgery.

3. The laser fibre is passed into the nose and directed towards the lacrimal sac thus there is no damage to the eye or its content.

Disadvantages of the transcanalicular laser assisted DCR

1. It may not be possible to address the lacrimal sump syndrome with transcanalicular DCR.

2. There is risk of canalicular injury with the technique.

3. Requires complex setup.

4. Difficult to remove the bone with this tecnique.

5. Inadequate size window with high chance of reclosure.

6. Success rate is very low.

Balloon dacryocystoplasty:

Balloon dacryocystoplasty is a new method based on recanalisation of the occluded lacrimal system. It was done for complete or partial obstruction of the lacrimal drainage system. A flexible tipped guide wire was introduced through the superior canaliculus into the inferior meatus and manipulated out of the nasal cavity. A 3 mm balloon catheter was then introduced in retrograde direction over the guide wire and dilated at the obstructed site[19].

The whole procedure can be done under local anaesthesia and stenting can be done to maintain the patency. Though it is a simple procedure success rate reported were not encouraging. The success rate is 50% for partial obstruction and 25% for complete obstruction[22, 24].

MATERIALS AND METHOD

This study was done at the Upgraded Institute of Otorhinolaryngology, Government General Hospital, Madras Medical College, Chennai-3 during the period of 2004 – 2006.

This study consists of series of 50 patients who were referred from Regional Institute of Ophthalmology, Egmore, Chennai for the management of chronic epiphora with nasolacrimal duct obstruction. Patient were evaluated at Regional Institute of Ophthalmology, Egmore, Chennai with the following tests:

- Pressure over the lacrimal sac for regurgitation of any fluid from punctum (ROPLAS TEST)
- Probing and syringing
- Jones dye test for level of obstruction
- Schirmer's test to prove increased lacrimation
- Conventional dacryocystography in selected cases.

Patients who had epiphora with the following inclusion criteria were selected :

Nasolacrimal duct Obstruction confirmed by the above tests with or without chronic dacryocystitis.

Pateints who had the following criteria were not selected.Those were

- Punctal block
- Cannalicular block
- Common cannalicular block
- Lacrimal sac tumors
- External compression of nasolacrimal duct
- Lacrimal passage tumors
- Lower lid problems.

Patients were examined at out patient department of upgraded institute of otorhinolaryngology, Government General Hospital, Chennai. Examination included anterior and posterior rhinoscopy, diagnostic nasal endoscopy and computed tomography of the paranasal sinuses to rule out any nasal pathology producing nasolacrimal duct obstruction, to assess any deviation of septum obstructing the view of lacrimal sac area and any associated chronic sinusitis / nasal polyps / tumours. Patients who fullfilled the inclusion criteria were selected for the study,

All the patients underwent dacryocystorhinostomy and were evaluated clinically and endoscopically for the subjective and objective relief of symptoms at three and six months respectively.

DISCUSSION

In this study 50 patients were evaluated and found to have nasolacrimal duct obstruction. All of them underwent Endonasal Endoscopic dacryocystorhinostomy.

Among 50 patients 40 were females (80%) and 10 were males (20%). Nasolarimal duct obstruction was more common in females than in males. Tsirbas et al[26], Steadman et al[23] studies also reflects that it is common in females.

Female patients were between the ages 18 to 60 years with mean age of 38 years and males were between 20 to 62 years and mean age of 42 years.

All the patients presented with watering of eyes. Epiphora is the common symptom with which patients presented with minimum duration of 4 months. 42 patients among them had swelling below the medial canthus of eye. 21 patients had swelling on the right side and 17 had swelling on the left side and the two had swelling bilaterally.

Along with epiphora 12 patients came with pain over the lacrimal sac region, 10 patients had associated nasal obstruction, 4 patients came with visual aquity problems and one with fever.

On compressing the lacrimal sac over the bone 33 patients had regurgitation of purulent material,12 patients had mucopurulent and 5 had watery discharge. Patient with long history of epiphora had purulent discharge and with less duration of disease had non purulent watery discharge. Consistency and nature of disease correlates well with the duration of the disease.

15 patients (30%)had high septal deviation to the side of lesion obscuring the view of lacrimal sac area and the root of attachment of middle turbinate. All the 15 patients with septal deviation underwent septal correction and subsequently underwent dacryocystorhinostomy after 6 weeks. One patient developed post operative adhesion between septal mucosa and lacrimal mucosa which was released after 4 weeks and underwent revision dacryocystorhinostomy. To prevent adhesion silastic sheat was kept over the septum and removed subsequently after 4 weeks.

Septal deviation per se is not responsible for chronic dacryocystitis. Septal deviations which are anterior and obscuring the lacrimal sac are dealt surgically to improve space between the septum and lacrimal sac area which is helpful in elevating the flap, avoiding preoperative mucosal injury and adhesion, post operative suction clearence and maintainance of patency of nasal cavity and neo ostium.[32, 33]

In our study 30% of patients underwent septal correction before DCR to improve the success rate of the surgery. Tsirbas et al[26] also reported 46% of the patient underwent septal correction for the better results of the surgery. So even though the septal deviation do not produce any nasal symptoms septal correction is done to make the nasal cavity roomy which helps in good flap elevation and making good ostium and also less postoperative adhesions and failure of surgery.

6 patients had chronic sinusitis as evidenced by clinical signs and diagnostic nasal endoscopy. All the patients had maximal medical therapy for three weeks and CT paranasl sinus was taken. Four patients had normal CT and underwent dacryocystorhinostomy.

One patient had large Agger nasi cell and Haller cell on the side of the chronic dacryocystitis and concha bullosa on the opposite side. Patient underwent Functional endoscopic sinus surgery. After 8 weeks of surgery he underwent dacryocystorhinostomy.

One patient had pneumatised uncinate and the same was removed during dacryocystorhinostomy.

Among 50 patients four patients went to Ophthalmologist primarily for refractive errors. They were diagnosed as senile cataract and were having associated chronic dacryocystitis and redness of the eye.They were sent to otorhinolaryngologist to address the chronic

dacryocystitis before correcting cataract. 4 weeks after DCR patient underwent cataract surgery.

Dacryocystitis is a relative contraindication for any surgical procedure in anterior and posterior chambers of the eye and DCR was done to relive the obstruction and symptoms.

Two patients had bilateral disease;Both of them underwent dacryocystorhinostomy on both sides at same time. One patient developed synaechia on left side and synaechia was released during the post operative visit.

One patient had bilateral sinonasal polyposis and left nasolacrimal duct obstruction. Patient underwent polypectomy and septal correction. Patient was managed with nasal douching and nasal steroid sprays for 5 months duration postoperatively. Epiphora was persistent even after 5 months and patient underwent dacryocystorhinostomy.

In all the 50 patients with epiphora, lacrimal passage was evaluated by syringing, Jones dye test, dacryocystogram, nasal endoscopic examination ,and computed tomography of paranasal sinuses. All of them underwent dacrycystorhinostomy. 47 patients underwent primary DCR and 3 underwent revision DCR.

Out of the 50 patients 36 had DCR on right side, 12 had surgery left side and 2 had surgery on both sides.

During surgery 2 patients had bleeding during elevation of flap. Bleeding stopped by bipolar cauterization and all the patients underwent nasal packing after surgery.

38 patients had very thick frontal process of maxilla and the same removed using the Kerrison's punch. In two patients complete exposure of the sac was not possible due the thick bone and with punch alone removal of the bone was not complete in them.In 12 patients it was thin and relatively easy to remove. We felt that in our technique removal of bone was difficult and time consuming with punches whereas powered instruments as mentioned in literature would have made bone removal easier and less time consuming.

After one month 5 patients had granulation and synechiae at the neoostium and the same removed with punch forceps. Daily saline douching was given. After 3 months two patients had recurrence of granulation.

Results of surgery was evaluated as relief of symptoms and patency of neoostium. Relief of symptoms is classified as complete relief, better than before and no improvement.

Results were analyzed after 3 months and 6 months respectively.

After 3 months in patients who underwent Primary dacryocystorhinostomy 89.4% (n= 42) had complete relief and 10.6% (n=

5) had improvement in symptoms and no patient was without improvement in symptoms.

Ostium was patent as evidenced by passive flow of dye into the nasal cavity in 93.6% (n= 44) and blocked in 6.4% (n= 3).

On nasal endoscopy granulation was seen at the mouth of the neo ostium. The same removed and regular postoperative syringing through the punctum every week along with nasal douching was done. Granulation was present in two patients in whom the fundus of the sac was not exposed properly due to thick bone.

After 3 months all patients who underwent revision DCR have a complete relief of symptoms 100% (n= 3). Neo ostium was patent in 100% (n= 3).

After 6 months in patients who underwent primary DCR complete relief from symptoms occurs in 45 patients (95.75%) and 2 patients had only improvement in symptoms (4.25%). Patency of ostium was good in all patients. The patients who underwent revision DCR had 100%[n=3] complete relief of symptoms and neo ostium was patent in all of them.

Hartikainen et al[6] reported success rate of 75% for endonasal DCR as opposed to 91% for conventional DCR. In Tsirbas et al[26], Metson et al[17], reports complete relief of symptoms was obtained in 95% of the

patients of nasolacrimal duct obstruction and 86% in common canalicular obstruction after six months.

This major shift in the success rate is due to the reorientation of the anatomy, opening the entire medial wall of the sac and good approximation of the mucosa. Initially it was perceived that lacrimal sac was lying anterior and inferior to the root of attachment of the middle turbinate.[5, 21.] This was wrong and according to Lindberg et al[14], Millman et al[18], Wormald et el[32], the sac is lying lateral to the axilla of the middle turbinate superiorly and anteroinferior part lies under the frontal process of the maxilla. This changed the technique of exposing the medial wall of the lacrimal sac and marsuplization of entire sac is possible with less post operative synechiae and blockage of common canaliculus[34].

There were no cases of orbital injury, frontal sinusitis, ethmoiditis, injury to lamina papyracea which can occur if the dissection is extended posteriorly and producing synaechia in frontal recess or ethmoidal infundibulum.

In our technique we do not use silicon or other types of stenting, which are supposed to maintain the opening of neo ostium, to prevent or correct synaechia of canaliculi and to facilitate postoperative dressings.

Silicon stents have become almost universally accepted adjunct in the lacrimal surgery for enhancing success rates in cases with relatively poor prognosis. Although silicon stents are absolutely inert and usually

harmless, on prolonged placement they can act as nidus for granuloma formation and infection leading to failure of the lacrimal surgery on long term. Moreover in advent traction to the nasal end can result in slitting of the puncta and cheese wiring of the canalicular complex whereas gradual ascent into nasal cavity can produce prolapse of tube at medial canthus[7].

We avoided using silicone tubing but concentrated on exposure of full lacrimal sac, marsuplisation of the sac and the trimming of nasal flap mucosa. With good patient selection, good exposure of lacrimal sac, good surgical technique and good postoperative care we could achieve success rate as high as that of external DCR.

A lacrimal sump syndrome and associated recurrent infection can occur if the lower portion of the bone surrounding the sac is not removed adequetly. Since we remove the entire bone our technique avoids this problem.

DEMOGRAPHY OF STUDY GROUP

	Primary DCR	**Revision DCR**
No. of Surgeries	47/50*	3/50*
Males	10/10#	Nil
Females	37/40+	3/40+

* Total no. of cases
\# Total no of Males
\+ Total no of females

RESULTS AFTER 3 MONTHS

	Primary DCR	**Revision DCR**
Complete relief of symptoms	42 (89.4%)	03 (100%)
Improvement of symptoms	05 (10.6%)	Nil
No improvement of symptoms	Nil	Nil
Patent Ostium	45 (95%)	03 (100%)
Obstructed Ostium	02 (5%)	Nil

RESULTS AFTER 6 MONTHS

	Primary DCR	**Revision DCR**
Complete relief of symptoms	45(95.75%)	03(100%)
Improvement of symptoms	02(4.25%)	Nil
Patent Ostium	47(100%)	03(100%)

CONCLUSION

Of the 50 patients who underwent the study the following conclusions are achieved.

a) Disease is common in middle age. More common in 30 – 40 years age group.

b) Females are affected more than males. 4: 1 ratio

c) Commonest presenting symptom is Epiphora.

d) Commonest sign of disease is regurgitation of purulent material on compression of sac.

e) Correction of high septal deviation improve the results of the surgery.

f) Treating the concurrent nasal disease appropriately prior to the lacrimal surgery improves the outcome.

g) Bilateral diseases could be managed simultaneously without much problem.

h) Common difficulties encountered were narrow nasal cavity, thick frontal process of maxilla and bleeding during elevation of flap.

i) Common postoperative problems were granulation and synechiae at the neoostium.

j) Nearly 95% patient had complete relief of symptoms.

k) Interestingly revision DCR had 100% complete relief of symptoms. This may be due to small sample size.

The success rate achieved by endonasal dacryocystorhinostomy was as high as that of external dacryocystorhinostomy without the disadvantages of external DCR.

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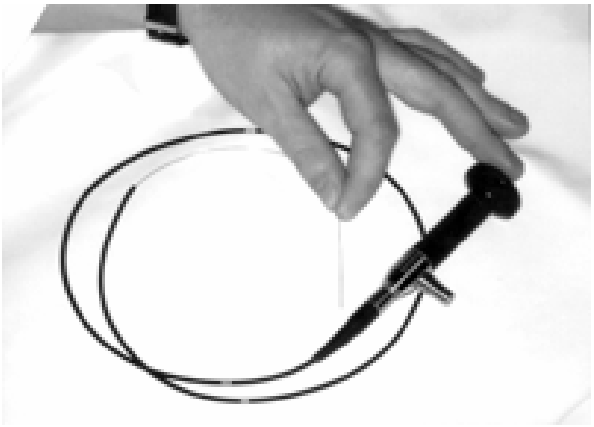
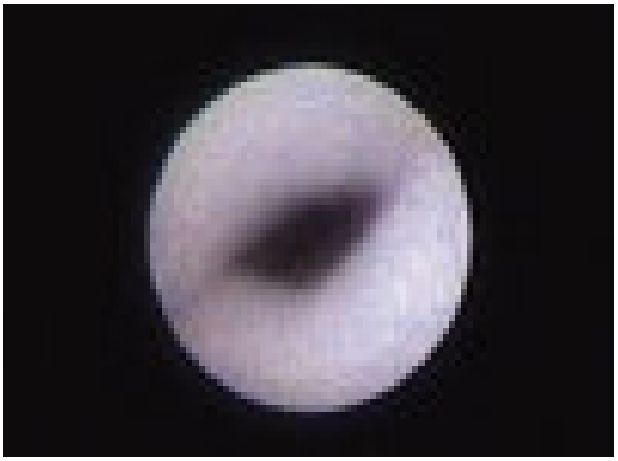
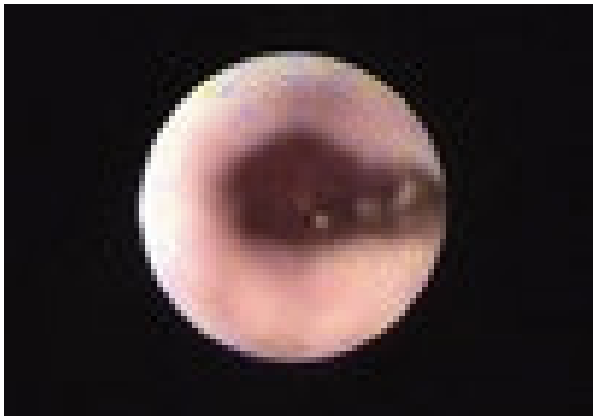


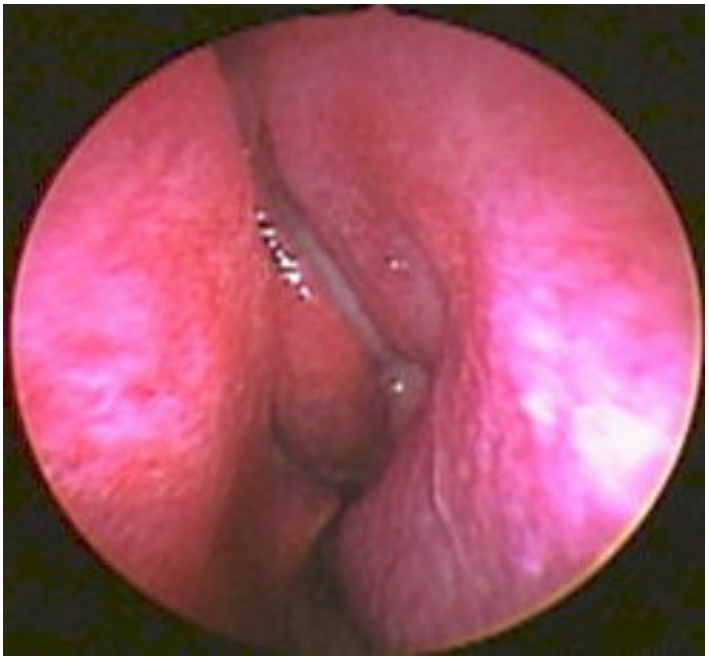
Lacrimal endoscope



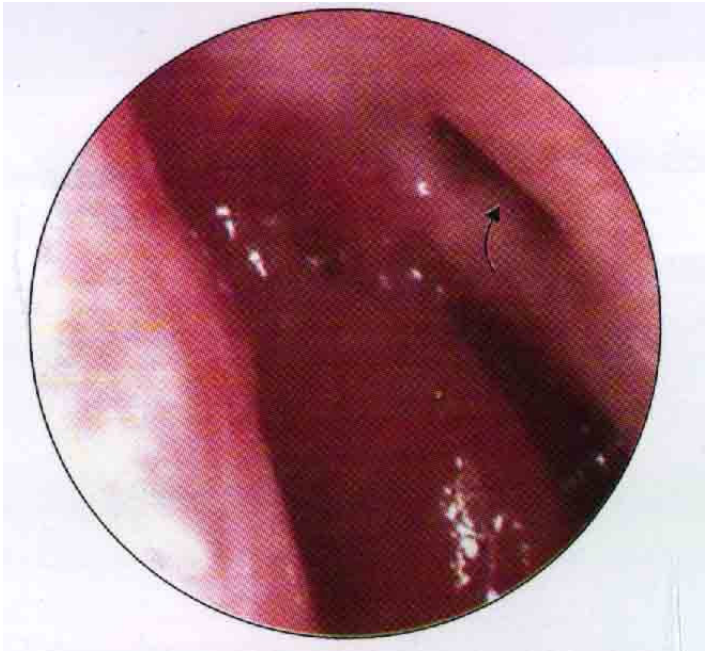
Normal common canaliculi



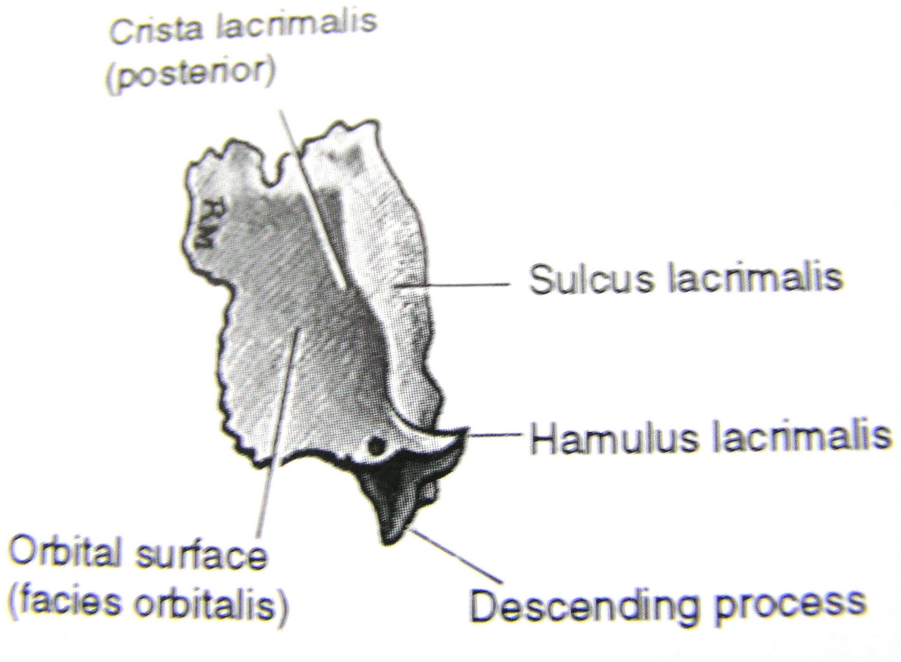
Granulation in the nasal lacrimal duct



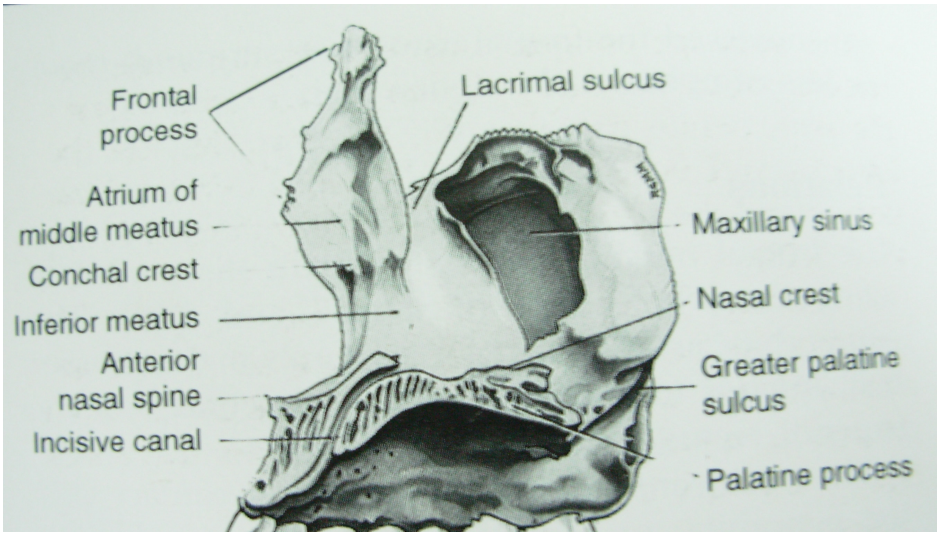
Lacrimal sac area



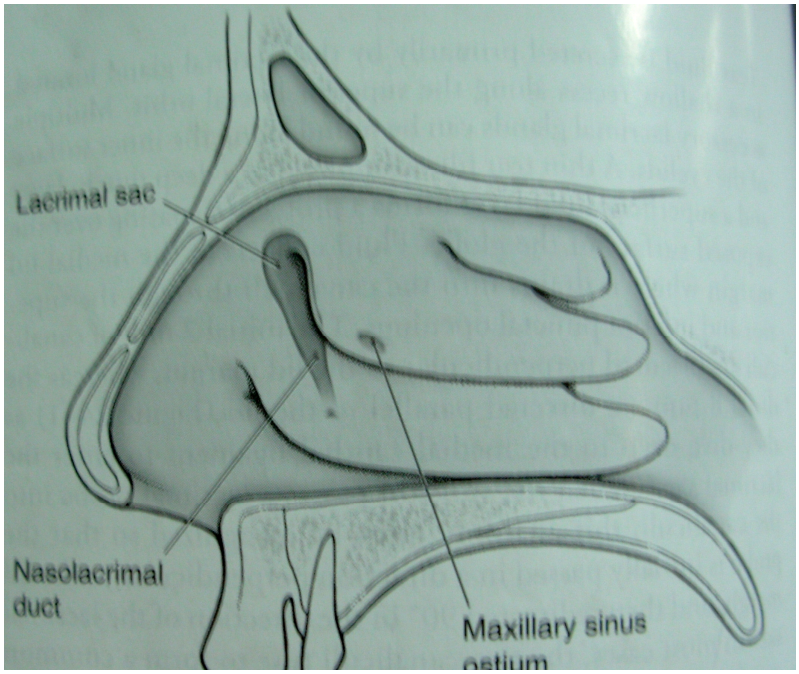
Neo ostium after 6 months



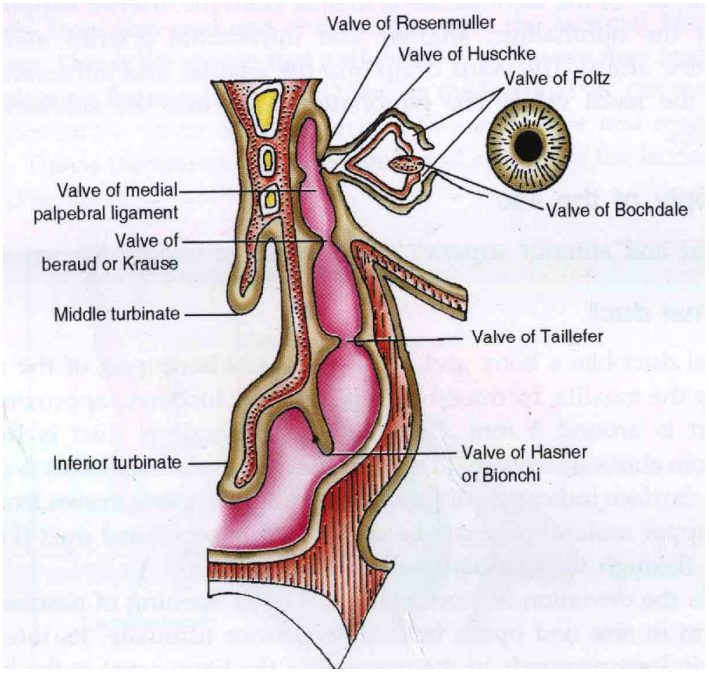
Lacrimal bone



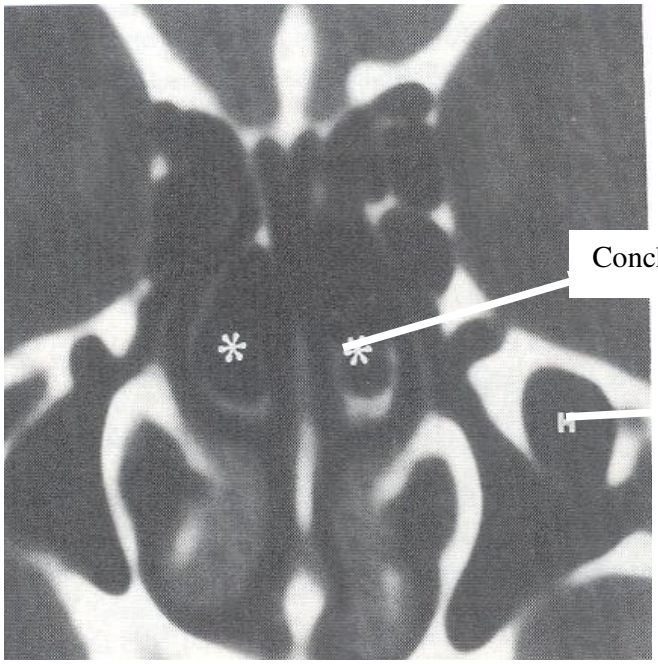
Maxilla

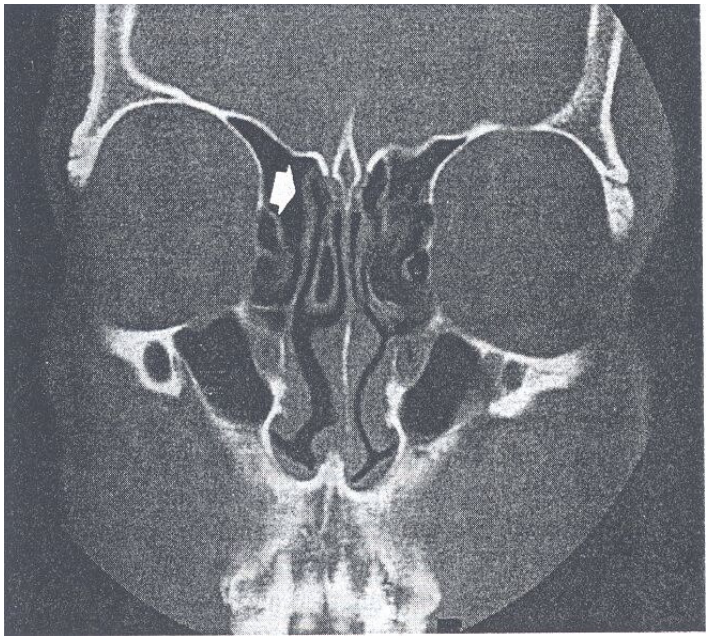


Position of lacrimal sac

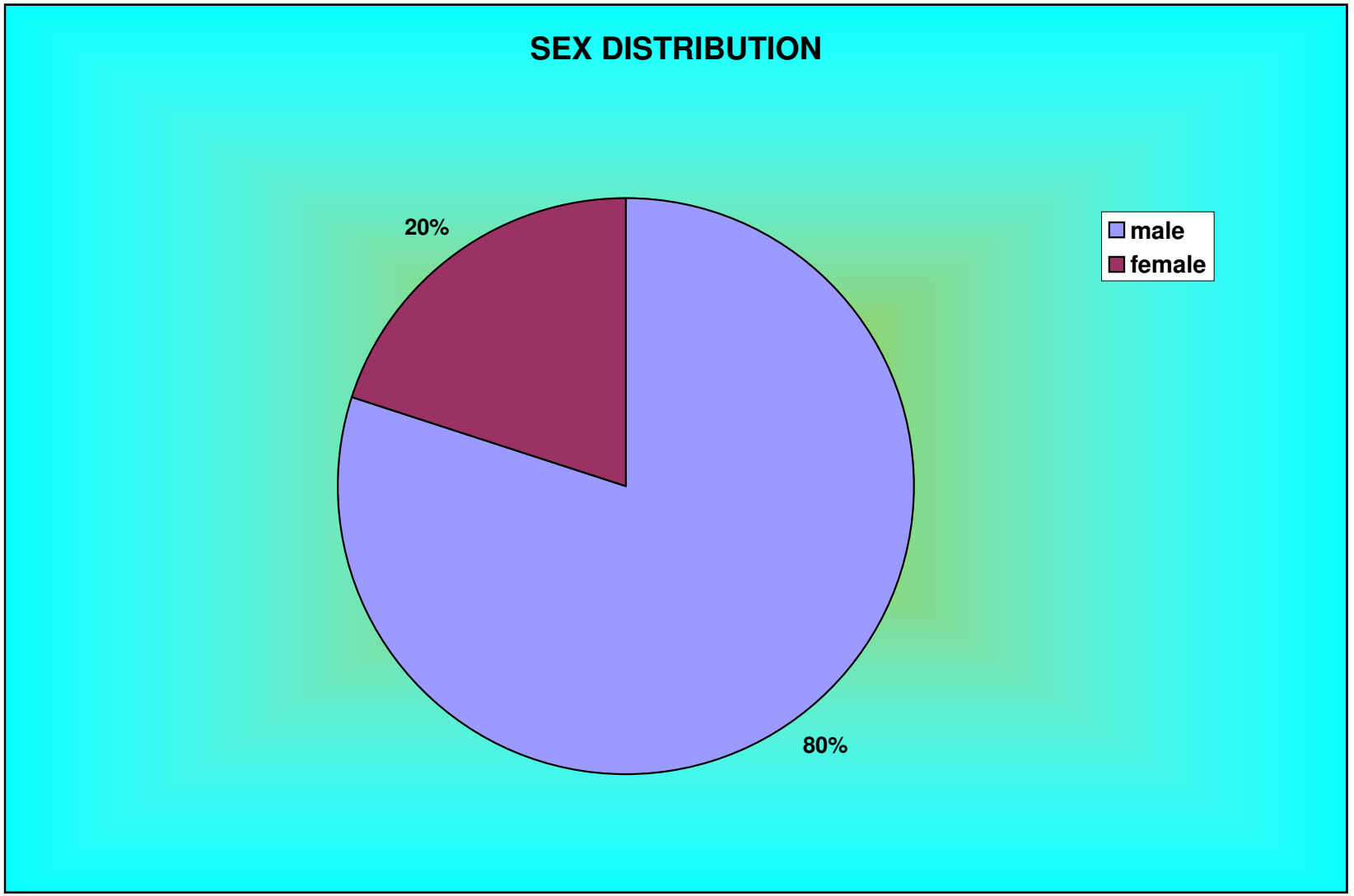


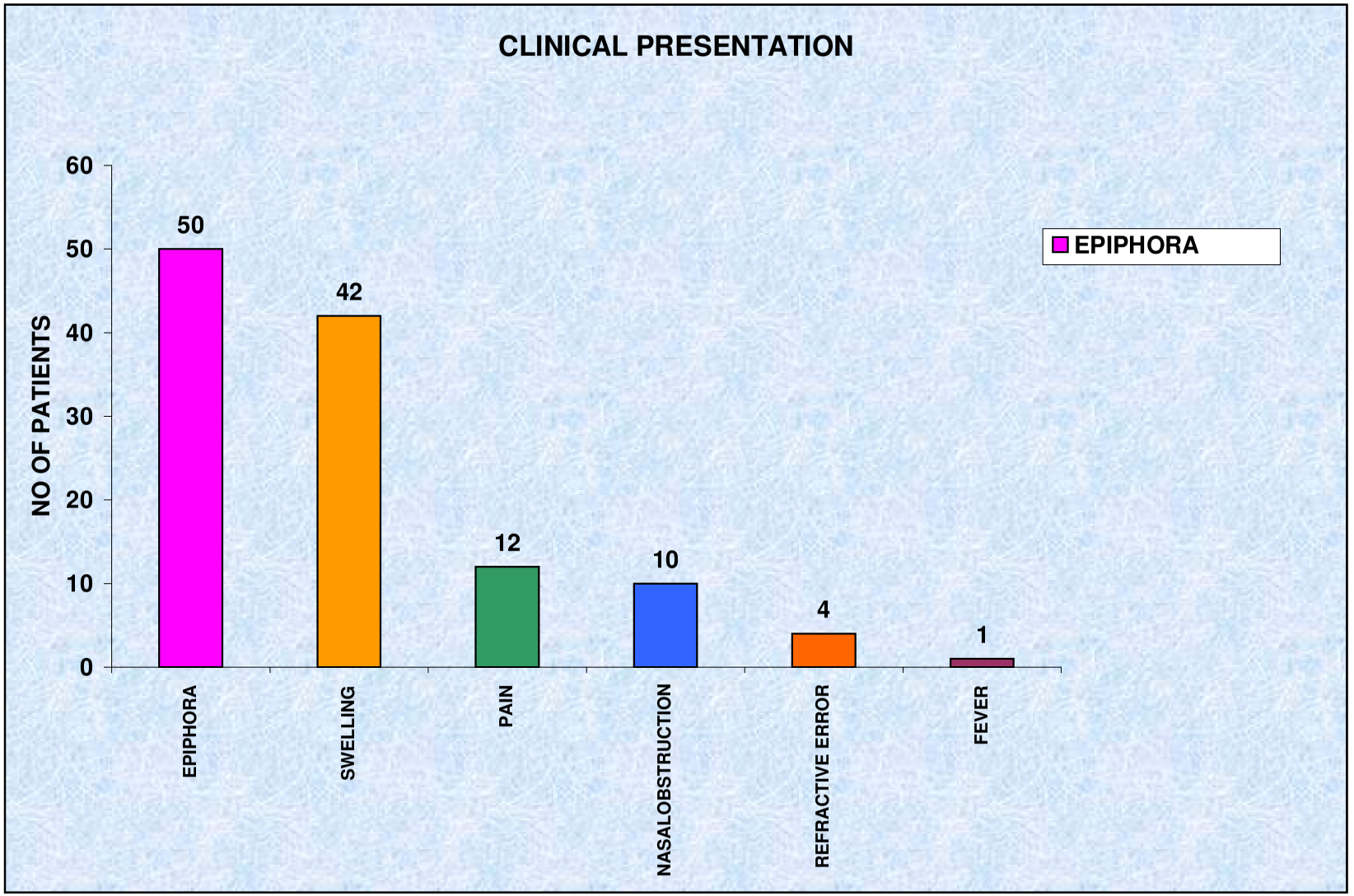
Valves of lacrimal passage





Narrow nasal cavity


SEX DISTRIBUTION
20%
80%
male
female


CLINICAL PRESENTATION
NO OF PATIENTS
60
50
40
30
20
10
0
50
42
12
10
4
1
EPIPHORA
SWELLING
PAIN
NASALOBSTRUCTION
REFRACTIVE ERROR
FEVER
EPIPHORA

PROFORMA

Name :

Age/Sex:

Address:

Date of admission:

Date of discharge:

Date of surgery:

Presenting complaint:

H/O presenting complaint:

Past history:

Personal history:

General examination: C.V.S

R.S

PULSE RATE

B.P

Systemic examination:

Examination of the eye:

	Right	Left
Lids		
Cornea		
Conjunctiva		
Sclera		
Lens		
Slit lamp examination		
Fundal examination		
Examination of nose		
External contour		
Anterior rhinoscopy		
Posterior rhinoscopy		
Cold spatula test		
Examination of the ear		
Examination of the throat		

Investigations

Pressure over the lacrimal sac(ROPLAS TEST)

Probing and syringing

Jones dye test

Schirmer's

Dacryocystography

Diagnostic nasal endoscopy

CT PNS

Blood complete hemogram

Blood urea, sugar, creatinine

E.C.G

X ray chest PA view

Anaesthetic assessment

Operative notes

Done by:

Indication for the surgery:

Assisted by:

Anaestheasia: local or GA

Staff Nurse:

Position :

Procedure :

Post operative period :

Follow up :

MASTER CHART

Patient name	Age / Sex	Type of surgery	Side of surgery	Ancillary procedure	Result after 6 months
Lakshmi	28/F	Primary DCR	Left	Septoplasty	Improved
Sindhu	19/F	Primary DCR	Right	Septoplasty	Improved
Nimi	22/F	Primary DCR	Right	Nil	Improved
Vijaya	38/F	Primary DCR	Right	Nil	Improved
Karpagam	48/F	Primary DCR	Right	Nil	Improved
vellaiyammal	60/F	Primary DCR	Left	Nil	Improved
Savitha	21/F	Primary DCR	Right	Septoplasty	Improved
Indira	18/F	Primary DCR	Left	Nil	Improved
Prema	38/F	Primary DCR	Right	Nil	Improved
Rani	32/F	Primary DCR	Right	Septoplasty	Improved
Rajkumari	26/F	Primary DCR	Right	Nil	Improved
Gandhimathi	57/F	Primary DCR	Lt/Rt	Septoplasty	Improved
Rohini	25/F	Primary DCR	Right	Septoplasty	Improved
Ilavarasi	35/F	Primary DCR	Left	Nil	Improved
Samundeswari	42/F	Primary DCR	Right	Septoplasty	Improved
Priyanka	24/F	Primary DCR	Right	Septoplasty	Improved
Selvi	34/F	Primary DCR	Right	Nil	Improved
Gomathi	36/F	Primary DCR	Right	Nil	Not improved
Asha	38/F	Primary DCR	Right	Septoplasty	Improved
Sundari	36/F	Primary DCR	Right	Nil	Improved
Kamala	33/F	Primary DCR	Right	FESS	Improved
Dhanalakshmi	58/F	Revision DCR	Right	Nil	Improved
Deepa	27/F	Primary DCR	Right	Nil	Improved
Priya	19/F	Primary DCR	Right	Nil	Improved
Lakshmi	55/F	Primary DCR	Left	Nil	Improved

Patient name	Age / Sex	Type of surgery	Side of surgery	Ancillary procedure	Result after 6 months
Kasthuri	26/F	Primary DCR	Right	Septoplasty	Improved
Jayarani	33/F	Primary DCR	Left	Endoscopic polypectomy	Improved
Kalpana	23/F	Revision DCR	Right	Nil	Improved
Umarani	44/F	Primary DCR	Right	Nil	Improved
Shanthi	50/F	Primary DCR	Right	Nil	Improved
Vijaya	52/F	Primary DCR	Right	Nil	Improved
Subulakshmi	48/F	Primary DCR	Lt/Rt	Septoplasty	Improved
Hemalatha	18/F	Primary DCR	Left	Nil	Improved
Valarmathy	31/F	Primary DCR	Left	Nil	Improved
Parvathy	26/F	Primary DCR	Right	Nil	Improved
Radha	31/F	Primary DCR	Right	Nil	Improved
Bagiavathy	56/F	Primary DCR	Right	Nil	Improved
Geetha	31/F	Revision DCR	Left	Nil	Improved
Sonia	38/F	Primary DCR	Right	Nil	Improved
Ramesh	20/M	Primary DCR	Right	Nil	Improved
Jagadesh	38/M	Primary DCR	Left	Septoplasty	Improved
Venugopal	45/M	Primary DCR	Right	Nil	Improved
Devan	46/M	Primary DCR	Right	Nil	Improved
Kumaresan	62/M	Primary DCR	Right	Nil	Improved
Arumugam	45/M	Primary DCR	Left	Septoplasty	Improved
Jammal	38/M	Primary CR	Left	Septoplasty	Improved
Kutiappan	35/M	Primary DCR	Right	Nil	Improved
Bose	26/M	Primary DCR	Right	Nil	Not improved
Swaraj	31/M	Primary DCR	Right	Nil	Improved
Keerthi	33/F	Primary DCR	Right	Nil	Improved